

## SCIENCE

**Graduation requirements:** three credits of high school science

**Core courses:** offered at foundations through honors levels

Earth Systems (9th) → Biology (10th) → Chemistry (11th) → Physics (12th)

**Elective courses:**

In the junior and senior year, students can take elective science courses instead of, or in addition to the core courses of Chemistry or Physics. The science elective courses are:

Full-year courses

|  |           |
|--|-----------|
| AP Biology   | 11th-12th |
| AP Environmental Science   | 11th-12th |
| Anatomy and Physiology   | 11th-12th |
| Marine Ecology Research Honors   | 11th-12th |
| Ocean Studies (does not count toward science graduation requirements)                      | 10th-12th |
| Integrated Physical Science Foundations (foundations alternative to chemistry and physics) | 11th-12th |
| Physics Through Technology   | 11th-12th |

Semester courses

|  |           |
|--|-----------|
| Astronomy  | 11th-12th |
| Forensics A<br>Forensics B                         | 11th-12th |
| The Maine Environment A<br>The Maine Environment B | 11th-12th |

| Course # | Course Title   | Grade Level | Credits | Prerequisites              |
|----------|--|-------------|---------|----------------------------|
| 400      | Exploring Earth Systems                              | 9           | 1       |                            |
| 401      | Earth Systems Foundations                            | 9           | 1       |                            |
| 405      | Exploring Earth Systems Honors                       | 9           | 1       | Corequisite: Alg. I Honors |
| 420      | Biology  | 10          | 1       | Earth Systems              |
| 425      | Biology Honors                                       | 10          | 1       | Earth Systems              |
| 452      | Biology Foundations                                  | 10          | 1       | Earth Systems              |
| 442      | Chemistry  | 11          | 1       | Biology and Algebra I      |
| 445      | Chemistry Honors                                     | 11          | 1       | Biology and Algebra I      |
| 473      | Integrated Physical Science Foundations              | 11-12       | 1       | Biology                    |
| 474      | Physics  | 12          | 1       | Algebra II                 |
| 475      | Physics Honors                                       | 12          | 1       | Biology and Algebra II     |
| 433      | <i>Physics Through Technology - not off. 2020-21</i> | 12          | 1       | <i>Algebra I</i>           |
| 436      | Forensics A (fall)                                   | 11-12       | ½       | Biology                    |
| 438      | Forensics B (spring)                                 | 11-12       | ½       | Biology                    |
| 482      | Anatomy & Physiology                                 | 11-12       | 1       | Biology                    |
| 458      | The Maine Environment A (fall)                       | 11-12       | ½       | Biology                    |
| 459      | The Maine Environment B (spring)                     | 11-12       | ½       | Biology                    |
| 470      | Astronomy  | 11-12       | ½       | Biology                    |
| 465      | AP Environmental Science                             | 11-12       | 1       | Biology                    |
| 428      | AP Biology   | 11-12       | 1       | Chemistry                  |
| 485      | Marine Ecology Research Honors                       | 11-12       | 1       | Biology                    |
| 1205     | Ocean Studies  | 10-12       | 1       | Teacher permission         |

**400 EXPLORING EARTH SYSTEMS, 9 (1 credit)**

This ninth-grade science course explores interactions between the geosphere, atmosphere, hydrosphere, and biosphere. This course will integrate chemistry, physics, biology, and earth science while investigating issues of relevance to everyone. Lab work, fieldwork, and analysis of data will be important components of this course.

**401 EARTH SYSTEMS FOUNDATIONS, 9 (1 credit)**

This ninth-grade course is designed to strengthen basic skills and stimulate interest in the sciences through an exploration of interactions between the geosphere, atmosphere, hydrosphere, and biosphere. Lab work, fieldwork, and analysis of data will be important components of this course.

**405 EXPLORING EARTH SYSTEMS HONORS, 9 (1 credit)**

*Prerequisite: Must be enrolled in or have completed Algebra I Honors*

This challenging ninth-grade science course is an exploration of interactions between the geosphere, atmosphere, hydrosphere, and biosphere. This course will integrate chemistry, physics, biology, and earth science while investigating issues of relevance to everyone. Lab work, fieldwork, and analysis of data will be important components of this course. Students may be required to conduct independent research. Exploring Earth Systems Honors goes into greater detail in each topic and is more math-intensive than Exploring Earth Systems.

**420 BIOLOGY, 10 (1 credit)**

*Prerequisite: Exploring Earth Systems or Exploring Earth Systems Honors, or Earth Systems Foundations with teacher recommendation*

This course is designed to provide students with a survey of the science of biology, covering ecology, evolution, and cell biology, including photosynthesis, cellular respiration, and genetics. Lab work reinforces classroom study. Emphasized skills include reading for understanding of content, data organization and analysis, use of lab equipment, use of the internet for scientific research, and scientific reasoning.

**425 BIOLOGY HONORS, 10 (1 credit)**

*Prerequisite: Exploring Earth Systems or Exploring Earth Systems Honors*

This course is designed to provide students with a survey of the science of biology. Areas of study include: ecology, the cell, photosynthesis, cellular respiration and division, reproduction, heredity, evolution, and classification of organisms from each of the phyla. Biology Honors students will be expected to complete a research presentation and additional readings, as well as to read at an independent level and to be personally responsible for their work planning and budgeting of time. Biology Honors goes into greater detail on each of the topics than Biology. Lab work is coordinated with and reinforces classroom study.

**452 BIOLOGY FOUNDATIONS, 10 (1 credit)**

*Prerequisite: Earth Systems Foundations or teacher recommendation*

This course explores the basic principles of biology, such as taxonomy and the diversity of life, cells, genetics, anatomy and physiology, cycles of matter, ecology, and evolution. Students will be encouraged to examine real-world issues as they relate to biological concepts. Lab investigations are an important part of this course.

**442 CHEMISTRY, 11 (1 credit)**

*Prerequisites: Biology or Biology Honors, and Algebra I*

This is a laboratory and math-intensive course for any student with an interest in chemistry. Students should be comfortable with Algebra and problem-solving. Students will learn the principles of chemistry through a mixture of laboratory, discussion, team-learning, and lecture formats. Topics covered include atomic structure, the states of matter, chemical names and formulas, chemical reactions, stoichiometry, the nature of energy, gas laws, electron structure and bonding, solution chemistry, and acids and bases. Laboratory investigations reinforce material covered in the class. Student evaluation will be based primarily upon reports, group work, quizzes, and tests.

**445 CHEMISTRY HONORS, 11 (1 credit)**

*Prerequisites: Biology and Algebra I*

This is a laboratory problem-solving course for honors students with a serious interest in chemistry. Students enrolled in this course should be very comfortable with algebra. This course is faster paced and covers more content than Chemistry. Students in this course will learn the principles of chemistry through a mixture of laboratory, discussion, and lecture formats. Topics covered include atomic structure, chemical names and formulas, chemical reactions, stoichiometry, the states of matter, gas laws, electron structure and bonding, solution chemistry, reaction rates and equilibrium, acids and bases, oxidation-reduction reactions, electrochemistry, and organic chemistry. Laboratory investigations and reports will review and reinforce material covered in the class. Student evaluation will be based primarily upon reports, group projects, quizzes, and tests.

**473 INTEGRATED PHYSICAL SCIENCE FOUNDATIONS, 11-12 (1 credit)**

*Prerequisite: Biology*

This laboratory course is a foundations alternative to chemistry and physics. It provides students with broad-based, hands-on learning experience in the various disciplines of physical science. The course centers around quarter-long sections on geology, meteorology, physics, and astronomy. Although there will be some mathematics, the emphasis of the course will be on the application of knowledge to solve problems and investigate scientific principles.

**474 PHYSICS, 12 (1 credit)**

*Prerequisites: Biology or Biology Honors, and Algebra I*

This is a math-intensive, problem-solving course for any student with a serious interest in mathematical problem-solving and the physical sciences. Students will learn from a combination of lectures, reading, labs, and problem-solving. Topics to be discussed will include concepts of mechanics including motion, forces, momentum, energy and energy transfer as well as heat, light, electricity and magnetism, relativity, and quantum theory.

**475 PHYSICS HONORS, 12 (1 credit)**

*Prerequisites: Biology or Biology Honors, and Algebra I*

This is a math-intensive, problem-solving course for any student with a serious interest in mathematical problem-solving and the physical sciences. This course covers more content and goes at a faster pace than Physics. For example, vector operations in Physics will be limited to simpler cases, while in Physics Honors, trigonometry will be required. Students will learn from a combination of lectures, reading, labs, and problem-solving. Topics to be discussed will include concepts of mechanics including motion, forces, momentum, energy and energy transfer, as well as heat, light, electricity and magnetism, relativity, and quantum theory.

**433 PHYSICS THROUGH TECHNOLOGY, 12 (1 credit) - not offered in 2020-21**

*Prerequisite: Algebra I, Algebra I Foundations, or Algebra I Honors*

*This course is activity oriented. Units are designed to help students understand that physics is used to help solve everyday problems by constructing devices to better serve our needs. Topics of study will be measuring devices; heat and temperature; properties of solids, liquids and gases; laws of motion, momentum, and mechanical energy like in rotational and circular systems; electricity and magnetism principles used in circuits, motors, and generators; and hydraulic systems.*

**436 FORENSICS A (fall), 11-12 (½ credit)****438 FORENSICS B (spring), 11-12 (½ credit)**

*Prerequisite: Biology*

Forensics may be taken in the fall and/or spring semester(s). It will incorporate skills acquired in biology, chemistry, and physics while learning techniques used by FBI and local police crime scene technicians. Topics covered may include the history of forensics, crime scene analysis, physical evidence, famous

cases, hair and fiber analysis, fingerprinting, DNA, foot and tire prints, fingerprinting, chemical detection, blood analysis and patterns, ballistics, handwriting analysis, facial reconstruction, anatomy, and fire and accident reconstruction. Along with hands-on labs skills, students will be solving mock crimes, requiring students to think, analyze, and imagine possible scenarios. Students will be required to work individually on research projects and in teams when analyzing mock crime scenes.

#### **482 ANATOMY AND PHYSIOLOGY, 11-12 (1 credit)**

*Prerequisite: Biology*

This course is designed for those wishing to enter any health-related profession or anyone generally curious about the human body. Students study most of the human body systems including muscular, nervous, skeletal, endocrine, cardiovascular, respiratory, digestive, and urinary. The course emphasizes lab work. *Note: We will dissect vertebrate specimens.*

#### **458 THE MAINE ENVIRONMENT A (fall), 11-12 (½ credit)**

#### **459 THE MAINE ENVIRONMENT B (spring), 11-12 (½ credit)**

*Prerequisite: Biology*

In this course, students will study natural history and gain an appreciation for the Maine environment. We will explore all aspects of the natural world from the land to the sea and from the trees to the soil. The curriculum will follow the four seasons we experience in Maine, and each season, we will explore which natural resources are harvested or managed (from deer hunting to forestry conservation). We will consider the impact of climate change and how human modification of the environment is influencing the population dynamics of different species, such as deer, moose, ticks, scallops, white pine trees, salmon, bears, turkeys, and woodpeckers. We will explore how scientific studies inform current fishing and hunting laws. We will bring in experts such as forestry ecologists, game wardens, freshwater fish biologists, state lawmakers, and local land trust managers. Overall, we will learn how science-based research can be used to protect and preserve the rich natural resources of our Pine Tree State for future generations of Mainers to enjoy.

#### **470 ASTRONOMY, 11-12 (1/2 credit)**

*Prerequisite: Biology*

This course exposes students to the practices and methods of one of the physical sciences, astronomy. Students learn concepts of modern astronomy, conduct observations through sky simulations, do laboratory and field investigations, work collaboratively, use scientific methods, and make informed decisions using critical thinking and scientific problem-solving. The course covers the following topics: discovering the night sky; gravitation and the motions of the planets; light, color, and telescopes; our star, the sun; the solar system, including both the terrestrial planets and the Jovian planets; moons; comets and asteroids; the lives of stars, galaxies, and cosmology; and exoplanets, astrobiology, and space exploration.

#### **465 AP ENVIRONMENTAL SCIENCE, 11-12 (1 credit)**

*Prerequisite: Biology*

This is a rigorous interdisciplinary course that explores the interconnections between the physical environment and living organisms, the impact of human activities on our planet, and our choices for the future. Topics to be covered include population dynamics, pollution, climate change, renewable and nonrenewable resources, risk assessment, and solutions to environmental problems. Labs and field activities are designed to encourage students to critically observe environmental systems, develop and conduct well-designed experiments, and analyze and interpret data.

#### **428 AP BIOLOGY, 11-12 (1 credit)**

*Prerequisite or corequisite: Chemistry*

This college-level biology course covers the same areas of study as the basic biology courses. Students in this course will be prepared for the AP Biology exam and are expected to take it.

**485 MARINE ECOLOGY RESEARCH HONORS, 11-12 (1 credit)**

*Prerequisite or corequisite: Biology*

This course is about marine ecology, which is the study of the interaction between organisms and their environment. It is intended for science-oriented students who have an interest in the ocean environment and want to learn how to conduct marine research. Students learn different research methods and techniques, and there will be an opportunity to conduct independent research projects to gain a better understanding of the full scientific process. The class takes advantage of our coastal campus and bases our work at field sites close to school. Investigation of the biological and physical factors that influence different habitats is the target of study, from the critters that control the rocky shore, to the open ocean dynamics that influence planktonic communities. Students will also conduct interviews with marine scientists from around the U.S. and visit at least one marine research facility in Maine.

**1205 OCEAN STUDIES, 10-12 (1 credit)**

*Prerequisite: By teacher permission, may be taken up to three times, does not count for science credit*

Ocean Studies is an interdisciplinary course that explores the many facets of the ocean ecosystem, from local to global scales. This course is for students who are interested in marine-related careers and prefer a hands-on approach to learning. Students will learn basic navigation and seamanship skills and will have the opportunity to participate in scientific research. Our coursework will be embedded in our local fishing community so that the work is relevant and timely. We will work with fishermen and other community members to understand the current issues in the fishery and use creative problem-solving and critical-thinking skills to develop an understanding of how to sustain local fisheries, as well as promote ocean health. Students will also participate in a variety of field trips ranging from excursions in our coastal ecosystem to regional organizations to meet scientists or policy makers who influence fishery regulations. Students will present their work at the Fishermen's Forum and also at the Eastern Maine Skippers Program year-end event.